
Image Credit: U.S. Army/Spc. Elisebet Freeburg, Joint Sustainment Command-Afghanistan PAO

National Aeronautics and Space Administration

Materials and Coatings

Nanoparticle-Containing Thermoplastic Composite Laminates

Strong, tough, thermally and chemically resistant composite laminates

NASA Langley Research Center has developed innovative nanoparticle-containing thermoplastic composite laminates. These thermoplastic composite laminates possess many improved characteristics over similar materials, including improved strength, toughness, and conductivity. They also possess improved thermal and flame resistance, as well as moisture and chemical resistance.

BENEFITS

- Improved strength, modulus, impact resistance, toughness, conductivity, permeation resistance, and radiation absorption
- Improved thermal and flame resistance, moisture and chemical resistance, hydrophobicity or oleophobicity, and hydrophilicity or oleophilicity
- Advantageous crystalline and amorphous properties
- Well-suited for automated processing

APPLICATIONS

- Aircraft
- Tanks and armored vehicles
- Automotive components
- Sporting goods
- Industrial and medical devices

technology solution

THE TECHNOLOGY

Thermoplastic composites are high strength material systems that are finding widespread application in a variety of fields, including aircraft, tanks and armored vehicles, automotive components, sporting goods, and industrial and medical devices. There is an ongoing desire to improve the functional and mechanical properties of composite laminates and to tailor these properties to specific applications.

Accordingly, this invention is for high quality thermoplastic composites and composite laminates with improved properties over other technologies. The composites comprise a thermoplastic polymer and a plurality of nanoparticles, and may include a fibrous structural reinforcement. The composite laminates are formed from a plurality of nanoparticle-containing composite layers and may be fused to one another via an automated process.

F-35. Image credit: U.S. Air Force photo/Senior Airman Brittany A. Chase

PUBLICATIONS

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More Information

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NASA's Technology Transfer Program pursues the widest possible applications of agency technology to benefit US citizens. Through partnerships and licensing agreements with industry, the program ensures that NASA's investments in pioneering research find secondary uses that benefit the economy, create jobs, and improve quality of life.

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